Out of the Shadow:

The Bright Future for Small Wind Systems

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BERGEY WINDPOWER

Bergey Windpower Co.

A World Leader in Small Wind

- BWC Established in 1977, Privately Held
- Manufactures Small Wind Turbines Rated at 1 and 10 kW (50 kW & 6 kW in Development)
- Serve Consumer, Commercial, and Industrial Markets
- ~2,900 Installations, Covering All 50 U.S. States and 90 Countries
- 350 U.S. and 150 Foreign Dealers
- Subsidiary in China (Beijing Bergey Windpower Ltd.) and Licensee in Australia (Venco)

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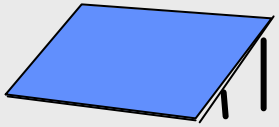
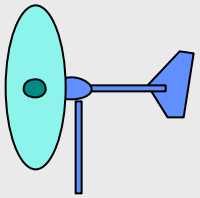
Clean Distributed Generation

Renewables for Homes, Farms, and Businesses

Status of the Technologies	 Photovoltaics	 Solar Thermal	 Small Wind
Status	Commercial	Demo	Commercial
Installed Cost	$ 9 / Watt	$ 15 / Watt	$ 4 / Watt
Payback Period	30 Years	30+ Years	15 Years
Cost Potential	$ 3 in 2010	?	$ 1.50 in 2010
Typical Site	Suburban	Southwest	Rural
Available Resources	Poor - Good	Poor - Good	Poor - Great

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Modern Small Wind Turbines:

High Tech, High Reliability, Low Maintenance

- Products from 400 W – 50 kW
- Technically Advanced
- Only 2-3 Moving Parts
- Very Low Maintenance Requirements
- Proven: ~ 5,000 On-Grid
- American Companies are the Market and Technology Leaders

(Not to scale)

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People Want Wind Turbines for Their Homes

"Please give me something that will lower my electric bills, will help the environment and that I can afford"

Bergey Windpower's web site (www.bergey.com) averages 20 – 30,000 hits a day !

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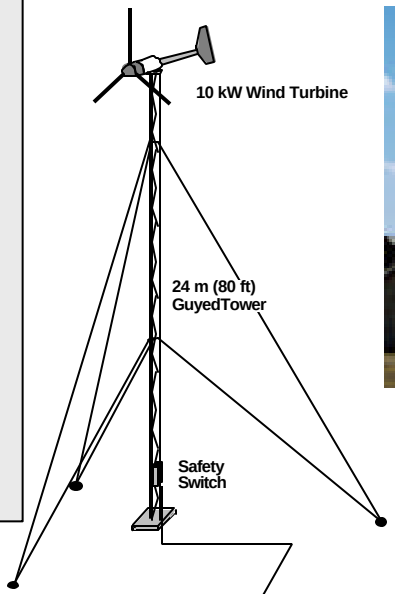
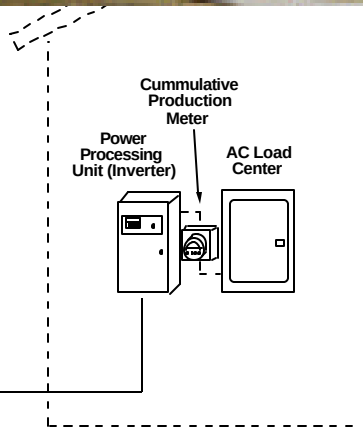
Rural Residential Wind

TYPICAL HOME SYSTEM

- 10 kW (23 ft. Rotor Diameter)
- Rural Site, 1 Acre or More
- Connected to House Wiring
- Produces ~ 13,000 kWh per Year
- Offsets ~ 7 Tons of CO_2 per Year
- Excess Power Sold to Utility (PURPA)
- Either Net Metering or Very Low Buy-Back Rate
- Cost: ~ $32,000 - $40,000





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The 64 mpg SUV

Remedy for “Soccer Mom’s Remorse”

19,700 Lbs

+

-15,700 Lbs

=

4,500 Lbs

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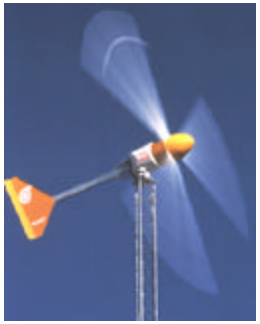
Annual CO_2 Emissions

More Expensive, but Also More Valuable

Large Turbines

- ~ $1,000 / kW
- High Voltage Delivery
- Value of Power:

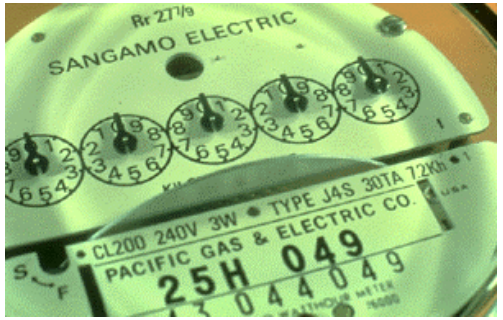
2-5¢



Small Turbines

- ~ $2 – 3,000 / kW
- Low Voltage Delivery
- Value of Power:

6-18¢



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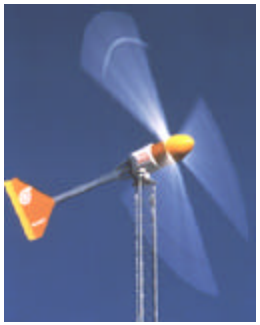
Small Turbines Require Less Wind

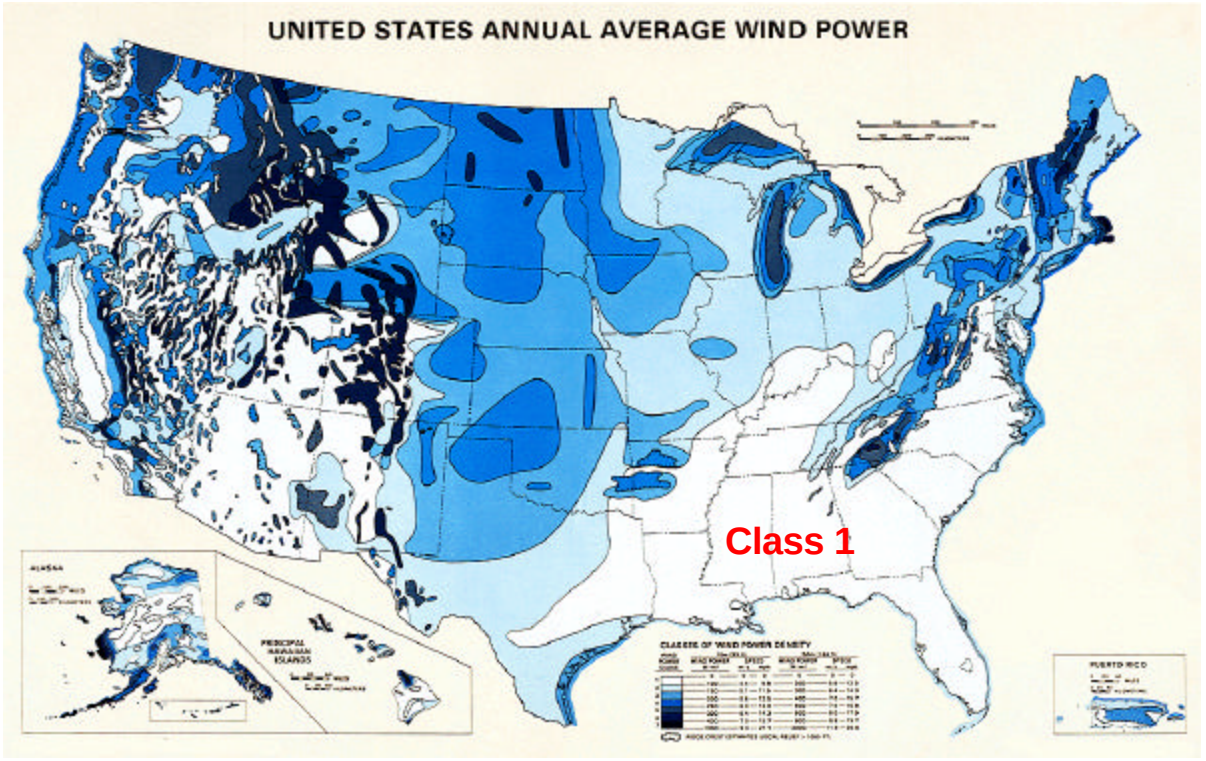
Large Turbines

- Require ~ Class 3-4 Wind Regime
- Prefer Class 5



Small Turbines

- Require ~ Class 2 Wind Regime



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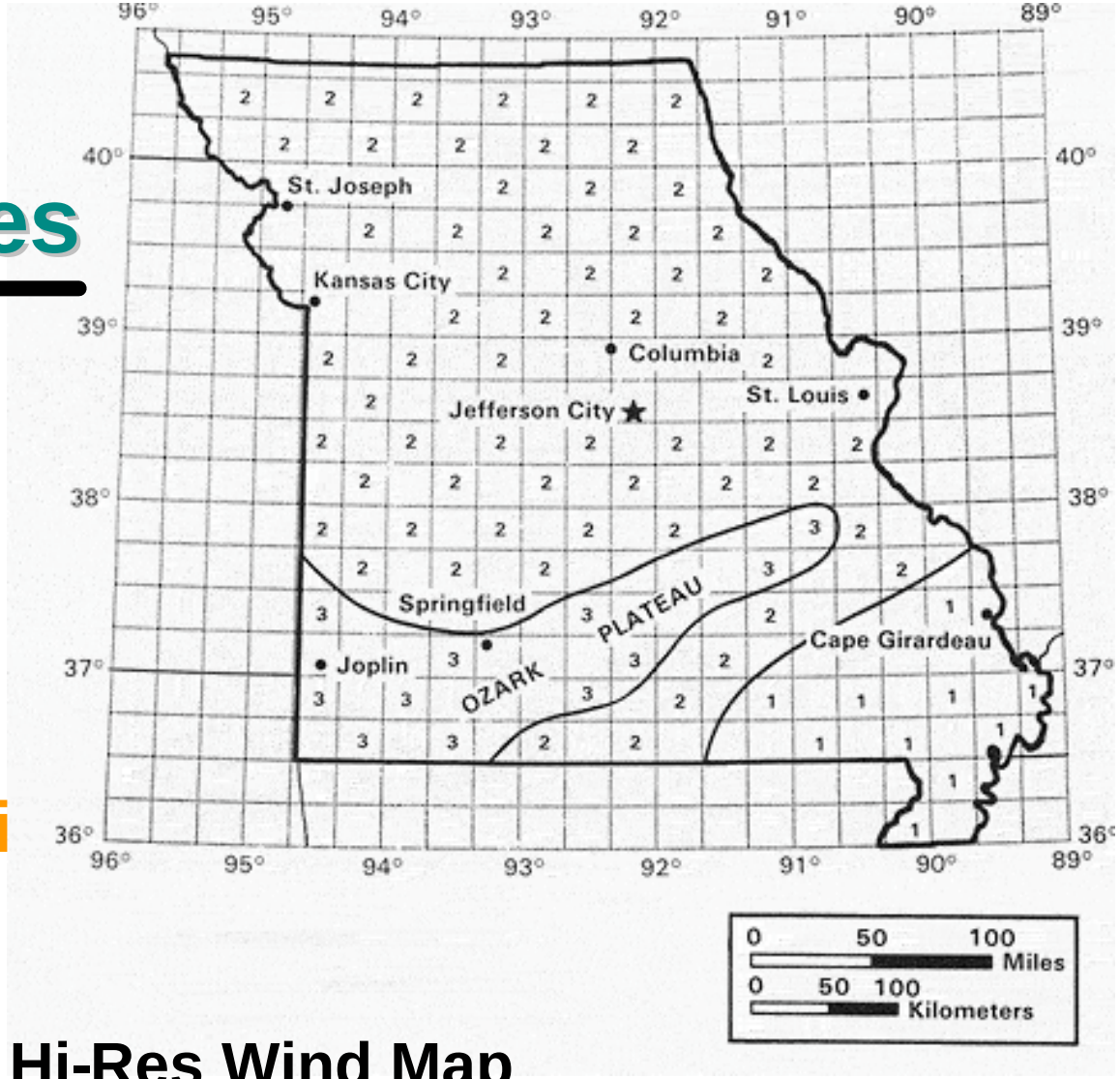
Missouri
Wind Resources

Small Wind needs only a Class 2 resource or better

Small wind works in most of Missouri



Eventually, Hi-Res Wind Map will likely reveal greater resources (as it Has everywhere else)

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Domestic Market: It's Back!

- State Rebate / Buy-down Programs are Reviving the Rural Residential Market
- Growing Consumer Interest in Clean Energy and Self-Generation

50% Grant

50% Rebate
+ 7.5% Tax Credit

60% Rebate in NJ

91% of Americans support tax incentives for renewable energy

CNN/USA Today Poll, May 9, 2001
Gallup Poll, Nov. 27, 2001

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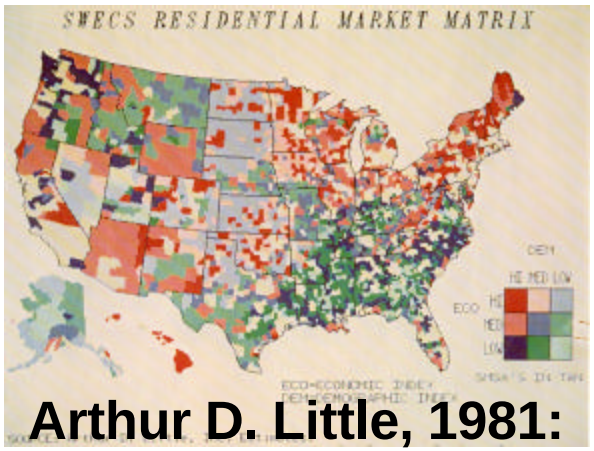
U.S. Market Potential: It's Big!

- Residential Electricity Consumption Exceeds Either Commercial or Industrial (35% of U.S. Sales in 1998)
- 20.6 Million Homes have 1 Acre or More
- 30.4 Million Homes have ½ Acre or More
- 4.6 Million Commercial Buildings
- Estimated 60% are in Class 2+ Winds



Arthur D. Little, 1981:
3.8 Million Units

Market Potential: **4 - 8 Million Units by 2020**

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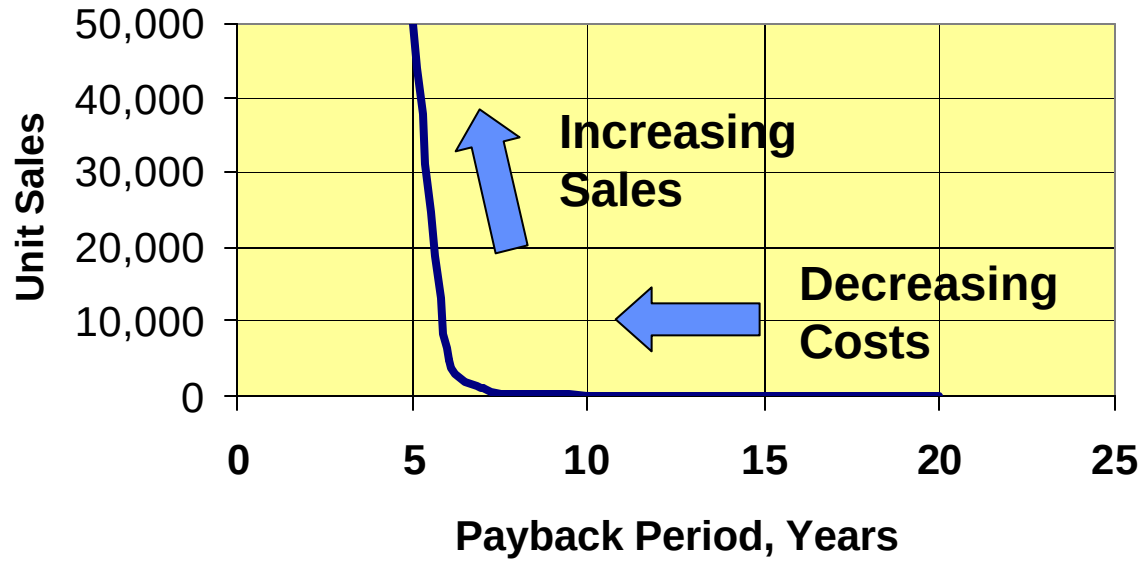
Market Growth Potential



Once the Numbers Work for One Home, They Work for Ten Thousand Homes

Small Wind Has Explosive Growth Potential

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Residential Market Potential

The Sleeping Giant

- **Rural Residential: 113,000 MW**
- **Misc. Facilities: 26,000 MW**
- **Total: 140,000 MW**

Small Wind Could Supply 3% of U.S. Electricity in 2020

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Source: AWEA Small Wind Technology Roadmap, May 2002 avail @ www.awea.org

Missouri Market Potential

Over 800,000 Rural Homes & Businesses

- 1981 Arthur D. Little Study for US-DOE Showed a Potential Market of 750,000 Small Wind Systems in Missouri
- Today, That Equals ~ 850,000 Million Rural Homes & Businesses, or 8,500 MW
- **Market Barriers are Significant**

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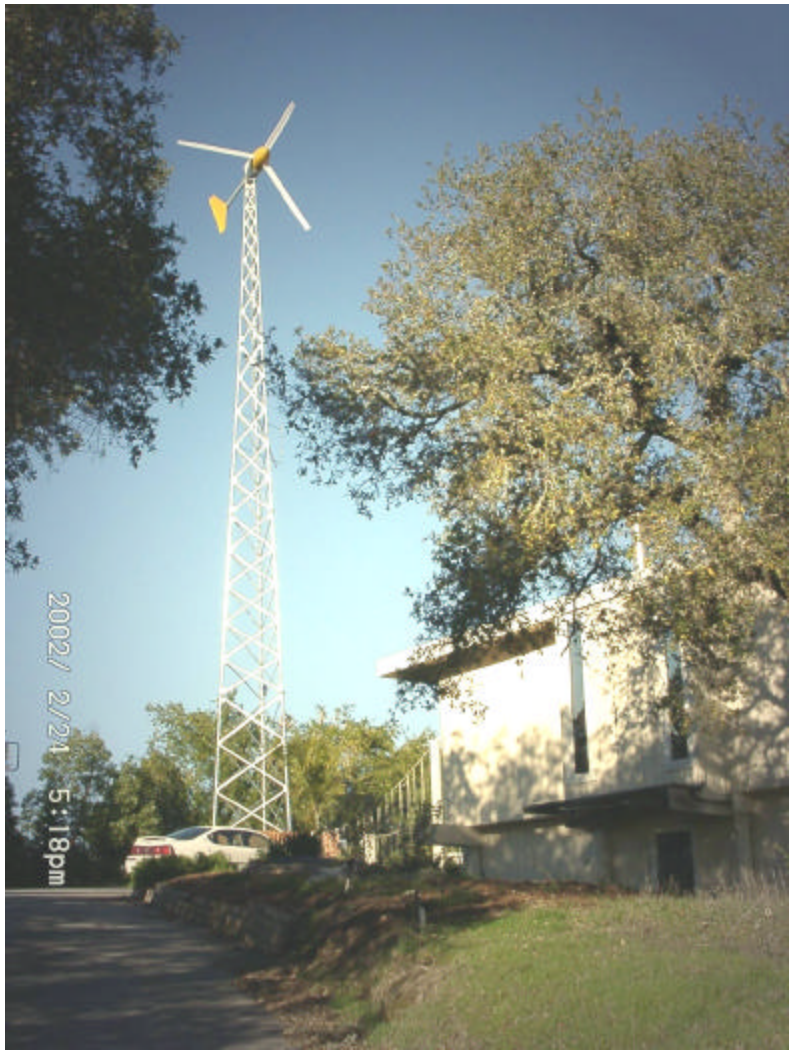
Barriers to the Market

Why Aren't There More Small Turbines

- **Economics: Low Production Volume & Historical Lack of Subsidies = High Costs**
- **Public Apathy Towards Energy**
- **Zoning / Permits: 35' Height Restriction in Residential Zones, NIMBY**
- **Little Private Sector Investment**
- **No Real Push by US-DOE in Last 15 Years**



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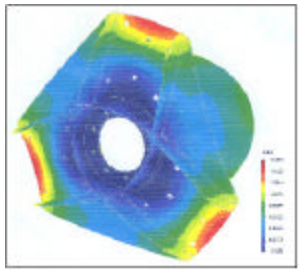
New Technology is Lowering Costs

US-DOE Advanced Small Wind Turbine Program + Industry Funded R&D

- Advanced Airfoils
- "Super-Magnet" Generators
- Low Cost Manufacturing
- Smart Power Electronics
- Very Tall Towers
- Stealth: Low Noise & Visual



3D Solid Modeling

Bergey 50 kW

Southwest Windpower 1.5 kW

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DOE Low Wind Small Turbine Program

- Modeled after the Low Wind Large Turbine program started in 2001
- Major multi-year program, funding TBD – but likely to be $10 – 20 million
- Multiple entry points
  - Conceptual designs / trade-off studies
  - Component development
  - Full turbine development

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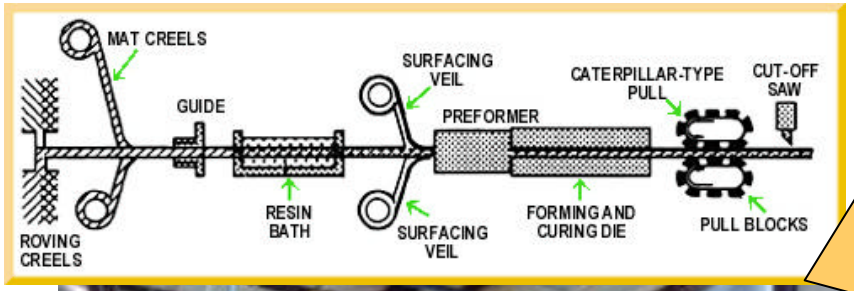
Example: Blades as High-Tech Spaghetti



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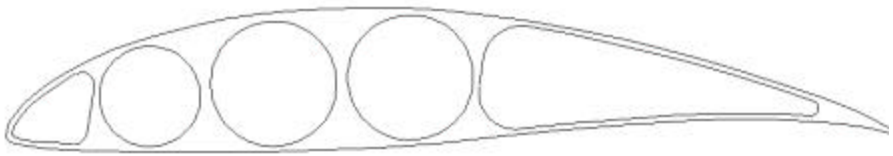
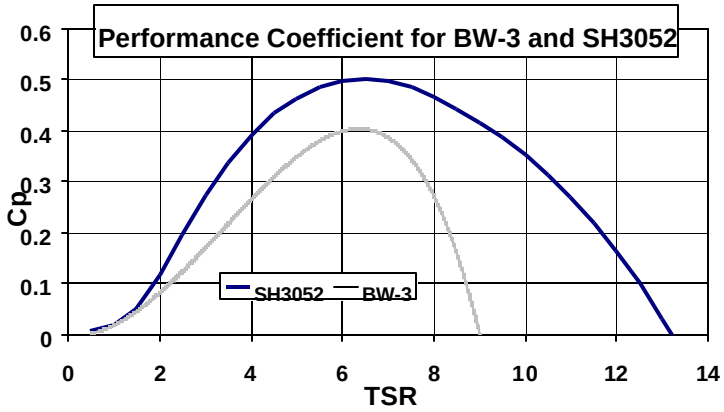


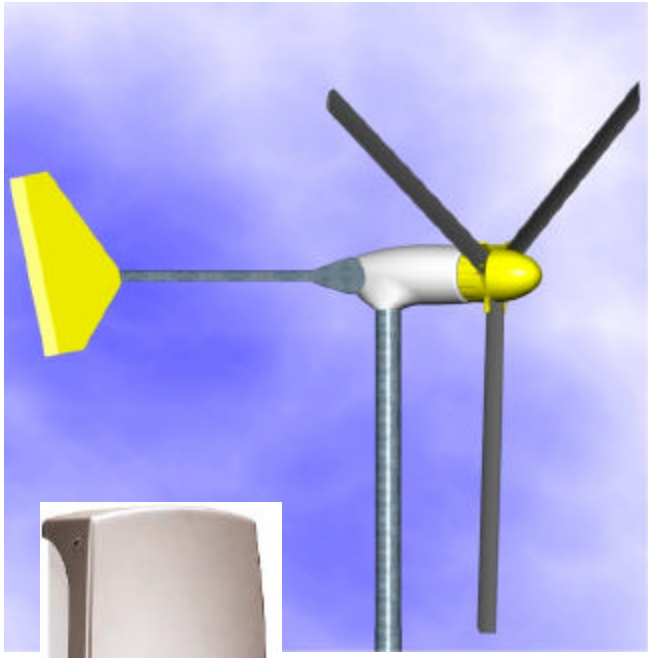
New Airfoil for BWC XL.50

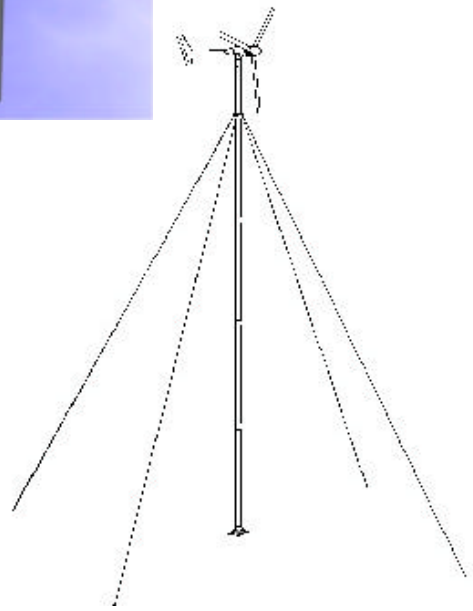


30% More Energy
25% Lower Costs
35% More Starting Torque

Low-Cost Grid Systems are Coming

- 1.5 kW, 8 ft. Diameter
- 100 - 250 kWh per month
- 5-Year Warranty
- Slow Rotor Speed - Almost Completely Silent
- Start-up at 7 mph
- Target Installed Cost Under $3,500
- Available in 2003





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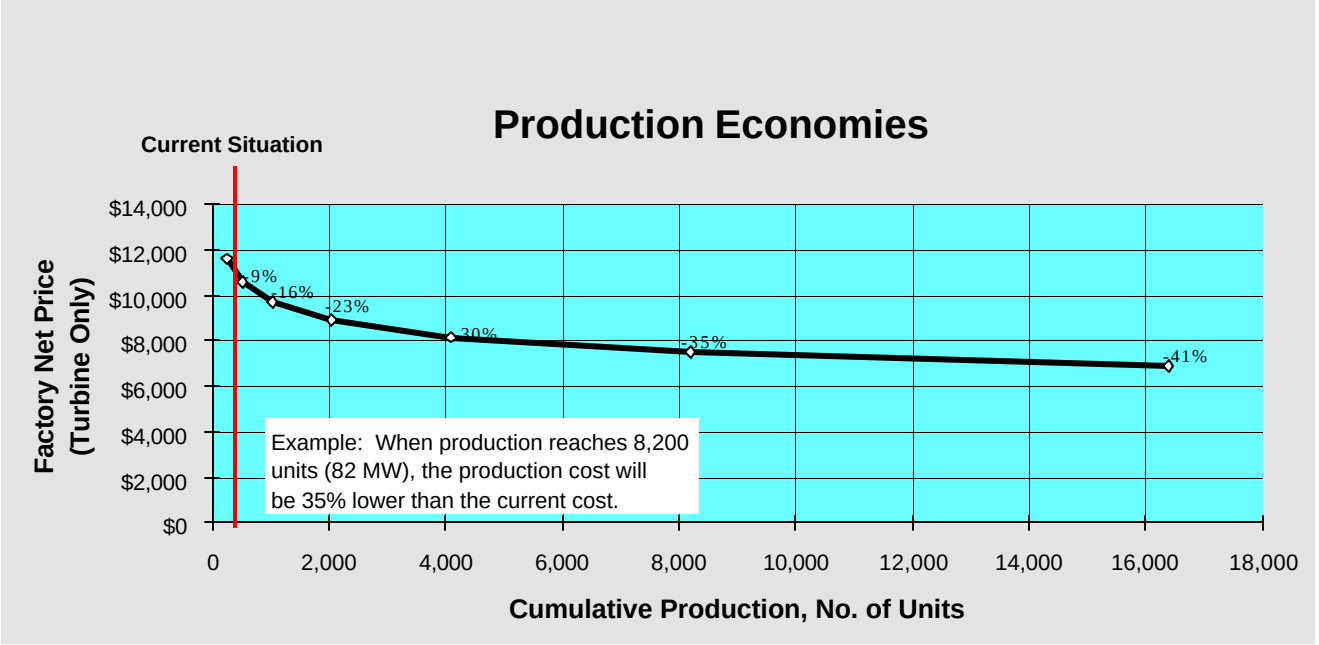
Volume Production will Drive Costs Down by 15 – 30%



Small Wind is a New-Age Appliance …

“ a ceiling fan on steroids”

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US-DOE has made Small Wind a Major Component of

WIND POWERING AMERICA

Clean Energy for the 21st Century

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Sources for Assistance and Information on Small Wind

- **American Wind Energy Assoc.**, Washington, DC
  www.awea.org or 202-383-2500
- **Bergey Windpower Co.**, Norman, OK
  www.bergey.com or 405-364-4212
- **Southwest Windpower**, Flagstaff, AZ
  www.windenergy.com or 928-779-9463
- **US-DOE National Wind Technology Center**, Boulder, CO
  Trudy Forsyth: 303-384-6932
  Jim Green: 303-384-6913

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National Energy Bill

- 30% Federal Tax Credit for Residential and Business Purchases of Small Wind Systems up to 75 kW
- Newly re-introduced in House: HR 790
- Senate bill will be re-introduced in mid-March
- Should be an Energy Bill in 2003
- You can help:

  Contact your Representatives and ask them to co-sponsor HR 790
- Missouri has Important Rep's: Hulshof on Ways & Means, Gephardt, Blunt and McCarthy on Energy & Commerce

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